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Polypetalous Forms of Vaccinium

W. H. Camp and C. L. Gilly

During the course of the last decade one of the authors of this brief paper has been giving some consideration to the Ericales. In this study abnormalities of several types have been noted in various groups. Among these is the polypetalous condition in *Vaccinium.*

In the genus *Vaccinium* the corollas are normally gamopetalous, yet the polypetalous condition is closely approached in two groups: namely, the circumpolar subgenus *Oxycoccus,* and the subgenus *Oxycoccoides* (= *Hugeria* Small), the latter found in southeastern North America and eastern Asia. In these two groups the corollas are not strictly polypetalous; instead, the corolla segments are deeply divided. It is to be noted that in *Befaria,* apparently one of the more primitive of the living ericalean genera, the corolla is always polypetalous and that this condition is cor-

related with an unstable number of parts of various of the floral organs.[1] Whether the deeply divided condition of the corolla in the subgenera *Oxycoccus* and *Oxycoccoides* of *Vaccinium* is a primitive character, or of more recent origin, is outside the present discussion. We are here concerned solely with the phenomenon of polypetaly in the subgenus *Cyanococcus*—the true blueberries—of eastern North America.

The usual gamopetalous corolla of *Vaccinium* indicates its derivation from a polypetalous type by the marked apical lobing and the folds which, in some species, lead from the sinuses toward the base (figure 1g). It is therefore not surprising that, on occasion, the normal gamopetalous corolla splits into its fundamentally component parts. This situation was recorded in the literature a few years ago by Weatherby. The description of this material indicates that the polypetalous condition was not completely stable, for various types of segmentation were present on the same plant.[2]

For the last several years the present authors have watched an abnormal clone which grows naturally in the woodland of the New York Botanical Garden on the hillside just south of the Arch Bridge, and which in consecutive years has produced polypetalous flowers (figures 1a-f). It is a low-growing form apparently derived from *Vaccinium torreyanum,* which is common in the area.[3]

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[1] Camp, W. H. Studies in the Ericales. A discussion of the genus *Befaria* in North America. Bull. Torrey Club **68**:100-111. 1941.

[2] Weatherby, C. A. A teratological form of *Vaccinium pennsylvanicum.* Rhodora **29**:237, 238. 1927.

[3] *V. torreyanum* is part of the complex which, in the manuals, has been called *V. vacillans.* The "vacillans-complex," spreading over much of eastern North America, contains the following: the southern and central Appalachian *V. pallidum* Ait. (not *V. pallidum* of the manuals), a somewhat coarse shrub with yellowish branches, sometimes ascending to two or even three feet; the more northern, northeasterly and Outer Piedmont *V. torreyanum* Camp with its delicate, mostly greenish-barked branches rarely rising to more than eighteen inches; the broad- and veiny-leafed *V. subcordatum* (Small) Uphof, a plant apparently confined to the Cumberland Plateau and several of its outliers; and *V. viride* Ashe and *V. missouriense* Ashe, both of which have their primary centers somewhere in the Ozark Plateaus. These last two are distinguished from the others by their puberulent leaves, the coarser *V. viride* apparently bearing much the same relation to *V. missouriense* that *V. pallidum* does to *V. torreyanum.* Whether it will be advisable in the future to keep these as nomenclaturally separate species, or to recognize them as parts of a widespread and regionally variable species, will be decided *only*

There is little need to give any detailed description of this plant except to call attention to the fact that the five corolla segments of each of the flowers examined were separate to the base. This condition was obvious even in the bud (figure 1b). As in the case of the plant noted by Weatherby (loc. cit.), the anthers apparently were abortive (figures 1d, e). Whether the sterility extended to the egg-apparatus has not been determined, although it is our observation that this plant does not set fruit. Furthermore, attempts to produce fruit through the medium of artificial pollination have been unsuccessful. However, this last is not a final conclusion, the attempts so far having been attended by conditions which admittedly were not ideal. In brief, we are not as yet convinced that this clone is incapable of setting fruit.

In addition to the polypetalous condition, one other abnormality should be noted. In sectioning the hypanthium of a series of the flowers of this clone it was found that the ovary of each had but four carpels (figure 1f), instead of the five carpels normal for *V. torreyanum* and its close relatives (figure 1j). This, however, is by no means unusual in the genus *Vaccinium*. It is quite common in certain species and is, in fact, a standard character of others. Nevertheless, this does indicate that the disturbance resulting in the polypetalous condition can also influence the number of carpels in the ovary. In this connection, it is of interest to note that various of the nearly polypetalous members of the subgenera *Oxycoccus* and *Oxycoccoides* are tetramerous, with the pentamerous condition being the abnormal form. Whether this condition is merely coin-

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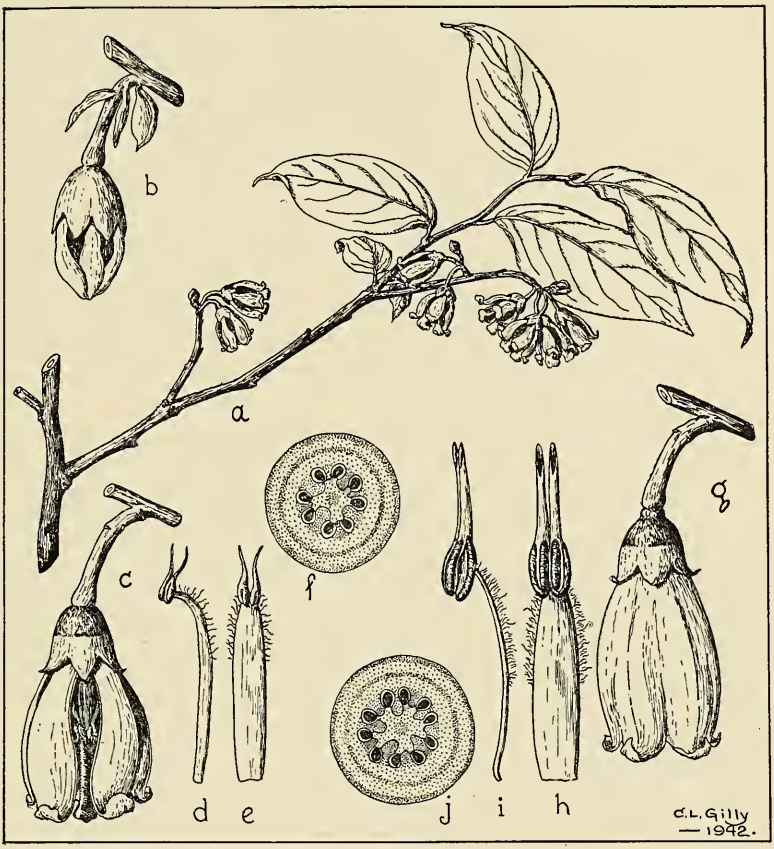
after further and much needed cytological studies of these entities have been made throughout their entire distributions. In addition to the foregoing, the "vacillans-complex" contains *V. tallapusae* (Cov.) Uphof, a derived tetraploid of the southern Appalachians which is best developed in Georgia; *V. altomontanum* Ashe of the southern Appalachians may also be a derivative of this group. *V. vacillans* var. *crinitum* Fernald, with which *V. missouriense* and *V. viride* have been confused, appears to be a series of hybrids and ecologically selected segregates from crosses between the markedly different *V. torreyanum* and *V. atrococcum*, both of which are diploid ($n = 12$) and known to be interfertile. The "high-bush" diploid *V. atrococcum* (A.Gr.) Heller apparently does not enter the ranges of *V. missouriense* and *V. viride*, being primarily an east-coast species; westward, it has been confused with *V. arkansanum* Ashe, and with the "arkansanoid" members of the tetraploid *V. corymbosum* L.



Figures 1a-f: Material from a clone of *Vaccinium torreyanum* growing naturally in the woodland of The New York Botanical Garden which, over a period of years, has borne polypetalous corollas. Figure 1a: Habit sketch of one branch, natural size. Figure 1b: Indicating the position of the petals in the bud, ×4. Figure 1c: The fully opened flower, ×4. Figures 1d, e: Two views of a stamen showing the abortive anther, ×8. Figure 1f: Diagrammatic cross-section of the hypanthium showing the four-carpeled ovary. Figures 1g-j: The flower from a normal clone of *V. torreyanum* growing near the former. Figure 1g: External view of the flower at anthesis, ×4. Figure 1h, i: Two views of a stamen showing the normal anther, ×8. Figure 1j: Diagrammatic cross-section of the hypanthium showing the normal five-carpeled ovary. As is common in *Vaccinium,* the "false partitions," coupled with the elongated placentae, give the appearance of a ten-carpeled ovary; the vascular structure (not included in the diagram) indicates its true nature.

cidental, or of fundamental evolutionary significance, is not known.

In addition to the clone here under consideration, one of the authors of this note has found much the same condition in other species. A collection of *V. atrococcum* from central New Jersey has been seen where the corollas were still gamopetalous, but with the segments so poorly united that even a slight pressure would cause them to fall apart. It was also found in a clone of *V. brittonii* Porter on High Point in the Kittatinny Mountains of extreme northern New Jersey. In *V. brittonii* the condition was variable, much as in the material mentioned in Weatherby's discussion. Incipient polypetaly has also been observed in other species of the genus but seldom in so complete a condition as the material figured in this paper.

It is therefore obvious that the individual plant in the genus *Vaccinium,* through some disturbance, may produce polypetalous corollas. The genetics of the situation so far has not been studied, for anther deficiencies often accompany the condition. There is also some slight but not conclusive evidence that the plants may also be sterile to viable pollen.

The nomenclature of such forms should be considered. Similar plants with at least deeply divided gamopetalous corollas have been the basis of such entities as *Rhododendron linearifolium* Sieb. & Zucc. (in which there is also some disturbance of the leaf form), *Kalmia latifolia* var. *polypetala* Nichols, and *Rhododendron atlanticum* forma *tomolobum* Fernald. There is evidence that the precise application of these epithets requires that they be used to refer only to single clones. Since this is the case—and essentially the same manifestation is the basis of a species, a variety and a form —it would seem only logical that some other category be selected to designate the polypetalous condition in the genus *Vaccinium,* and thus complete the nomenclatural cycle.

The foregoing is said less in jest than may at first appear to be the case. It is not the primary purpose of this paper to discuss the proper nomenclatural disposition of such obviously aberrant material. However, it would seem that nomenclature should at least be functional; that its purpose is not only the listing of differentiable entities, but also that it should in some way indicate their proper relationships. Therefore, it is our opinion that, where there is need, an organism should have a name but that the category to which it

is assigned should have some biological significance in a system of nomenclature. This is equally true of horticultural material and of organisms growing naturally under feral conditions. In this instance, it is doubted whether a single aberrant clone—as *Rhododendron linearifolium*—deserves specific rank, particularly when the normal form has to take nomenclaturally subsidiary rank under it as a variety.[4]

Were the polypetalous individuals of *Vaccinium* to be brought into cultivation—and if propagated by asexual means—they would deserve no more than the category of "lusus" as originally defined by DeCandolle. Yet it is admitted that this material is of little or no importance either as a horticulturally or otherwise useful plant-type. It is therefore thought best not to further encumber the literature of the group with a series of subspecific names which, for the present, would seem to serve no practical purpose. The polypetalous condition in *Vaccinium* is perhaps of some interest from the botanical standpoint and it is for this reason that this paper has been prepared. Further study of the phenomenon may lead to other work on the origin of somewhat similar forms and thus perhaps shed light on one phase of the general evolution of the group. Some future worker dealing with these matters may find it desirable to give names to such individuals, if only to particularize and expedite his discussions; for the present—to us at least—they are only items of general biological interest and therefore scarcely worthy of nomenclatural recognition.

The New York Botanical Garden
New York, New York

[4] Rehder (Man. Cult. Trees and Shrubs, 1940) begins the description of *Rhododendron linearifolium* as follows: "A garden form of the following . . . ." The following entity is *R. linearifolium* var. *macrosepalum* (Maxim.) Mak. One wonders how the apparently basic, normal material can be considered a variation of an obviously derived and abnormal, vegetatively propagated clone (and therefore, biologically, an individual) except where nomenclature is an end in itself rather than a means by which information can be better organized. The writers of this note bow to the accusation that they hold to the principle that nomenclature, as such, should be a tool in the science of systematics, rather than the view that systematics is a mental diversion appended to the science of nomenclature.